Chapter Review Exercises (page 732)

R11.1 *State:* We want to perform a test at the $\alpha = 0.01$ significance level of H_0: The proposed 1:2:1 genetic model is correct versus H_a: The proposed 1:2:1 genetic model is not correct. Or, $H_0: p_{green} = 0.25,\ p_{yellow-green} = 0.50,\ p_{albino} = 0.25$ versus H_a: At least two of the p_i's is incorrect. *Plan:* We should use a chi-square test for goodness of fit if the conditions are met. Random: The data come from a random sample. 10%: $n = 84$ is less than 10% of all yellow-green parent plants. Large Counts: The expected counts are all at least 5 (green: 84(0.25) = 21, yellow-green: 84(0.50) = 42, albino: 84(0.25) = 21). *Do:* The test statistic is $\chi^2 = \frac{(23-21)^2}{21} + \frac{(50-42)^2}{42} + \frac{(11-21)^2}{21} = 6.476$ Using df = 3 – 1 = 2, the *P*-value is between 0.025 and 0.05. *Using technology*: *P*-value = 0.0392. *Conclude:* Because the *P*-value of 0.0392 is greater than $\alpha = 0.01$, we fail to reject H_0. We do not have convincing evidence that the proposed 1:2:1 genetic model is not correct.

R11.2 Several of the expected counts are less than 5 (see table below).

	0	1	2	3	4
Knowledgeable	12.5	0.5	4.5	1.5	5
Ignorant	12.5	0.5	4.5	1.5	5

R11.3 (a)

	Stress management	Exercise	Usual Care	Total
Suffered cardiac event	3	7	12	22
No cardiac event	30	27	28	85
Total	33	34	40	107

(b) The success rate was highest for stress management (30/33 = 0.909), followed by exercise (27/34 = 0.794) and usual care (28/40 = 0.70).

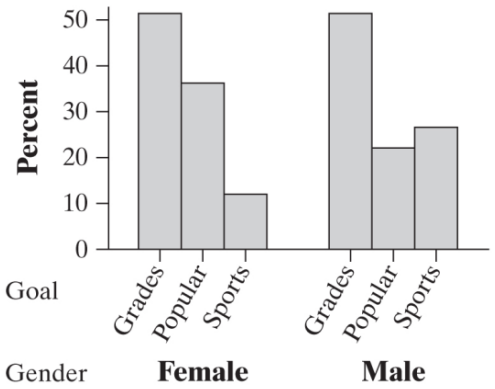
(c) *State*: We want to perform a test of H_0: The true success rates for patients like these are the same for all three treatments versus H_a: The true success rates for patients like these are not the same for all three treatments at the $\alpha = 0.05$ level. *Plan*: We should use a chi-square test for homogeneity if the conditions are met. Random: The data came from three groups in a randomized experiment. Large Counts: The expected counts are all at least 5 (see table below).

	Stress management	Exercise	Usual Care	Total
Suffered cardiac event	6.79	6.99	8.22	22
No cardiac event	26.21	27.01	31.78	85
Total	33	34	40	107

Do: The test statistic is $\chi^2 = \frac{(3-6.79)^2}{6.79} + \ldots + \frac{(28-31.78)^2}{31.78} = 4.840$. With df = (2 – 1)(3 – 1) = 2, the *P*-value is between 0.05 and 0.10. *Using technology*: *P*-value = 0.0889. *Conclude*: Because the *P*-value is greater than $\alpha = 0.05$, we fail to reject H_0. We do not have convincing evidence that the true success rates for patients like these are not the same for all three treatments.

R11.4 (a) A test for homogeneity would be appropriate if the data came from 3 independent random samples—a random sample of ads from magazines aimed at young men, a random sample of ads from magazines aimed at young women, and a random sample of ads aimed at young adults in general. In each sample, the ads would be classified as sexual or not sexual.
(b) A test of independence would be appropriate if the data came from a single random sample of ads from magazines aimed at young adults. Then, each ad in the sample would be classified as sexual or not sexual and the magazine that the ad was from would be classified as aimed at young men, young women, or young adults in general.
(c) The first number is the percentage of ads in women's magazines that are found to be not sexy: $\frac{351}{576} = 0.6094 = 60.94\%$. The second number is the expected count for the number of ads in women's magazines found to be not sexy: $\frac{(1113)(576)}{1509} = 424.8$. The third number is the contribution to the chi-square statistic from this same cell: $\frac{(351-424.8)^2}{424.8} = 12.82$. (The difference is due to rounding error.)
(d) The "sexual, Women" cell contributes the most to the chi-square statistic with a chi-square component of 36.074. There were 225 observed ads in this cell, which was much more than expected (225 – 151.2 = 73.8).

R11.5 (a)



Both groups of children have the largest percentage reporting grades as the goal. But after that, boys were more likely to pick sports whereas girls were more likely to pick being popular.
(b) *State*: We want to perform a test of H_0: There is no association between gender and goals for 4th, 5th, and 6th grade students versus H_a: There is an association between gender and goals for 4th, 5th, and 6th grade students at the $\alpha = 0.05$ level. *Plan*: We should use a chi-square test for independence if the conditions are met. Random: The data came from a random sample. 10%: $n = 478$ is less than 10% of all 4th, 5th, and 6th grade students. Large Counts: All of the expected counts are at least 5 (see table below).

	Female	Male
Grades	129.70	117.30
Popular	74.04	66.96
Sports	47.26	42.74

Do: The test statistic is $\chi^2 = \frac{(130-129.7)^2}{129.7} + ... + \frac{(60-47.26)^2}{42.74} = 21.455$. With df = (3 – 1)(2 – 1) = 2, the *P*-value is less than 0.0005. *Using technology*: *P*-value = 0.00002. *Conclude*: Because the *P*-value of 0.00002 is less than α = 0.05, we reject H_0. There is convincing evidence that there is an association between gender and goals for 4th, 5th, and 6th grade students.